NCEM / LBNL
Chemistry & Specimen Laboratory Safety Training Advisory & Checklist

Note: A completed, original copy of this form must be provided by the researcher before he/she will be allowed to begin any work at the National Center for Electron Microscopy. Researchers are encouraged to complete this form prior to arriving at LBNL so that NCEM staff can review it and make preparations for safe, efficient use of time.

Researcher Name _____

Proposal # _____

Proposal Title _____

What is the material of your sample? _____

1. Specimen Preparation

The following equipment is available for specimen preparation:

- Ultrasonic cleaner
- Diamond saw (Isomet)
- Polishers (Ecomet, Minimet, Handimet)
- Ultrasonic disc cutter (Gatan)
- 3 Dimplers (2 VCR, and 1 Gatan)
- 3 ion mills (Gatan, Fischione)
- Plasma cleaner (Fischione)
- Electro-polisher (Fischione)
- 2 Optical microscopes (Magnification up to 1000x)
- 2 Optical stereo microscopes
- Furnace (annealing in air to 200°C)
- 5 Fume hoods for chemical polishing & chemicals
- South Bay IV3 Ion mill with low voltage (0.1 - 2kV) ion gun
- Digital recording of optical micrographs

Will you bring completed specimens? ---yes ----no

Do you intend to do any electropolishing of samples? ---yes ----no

Do you intend to do any chemical thinning? ---yes ----no

Do you intend to do any dimpling or ion milling? ---yes ----no

Will you require specimen preparation support and if yes, please specify what help you will need:

2. Training

LBNL requires that all employees and guests be properly trained to safely complete work. Courses completed at LBNL may be used to comply with these requirements. Your LBNL supervisor may waive some of the LBNL courses based upon previous safety training you have completed elsewhere.

A. The following course is MANDATORY for all employees and guests at NCEM.

- Mandatory: Introduction to EH&S, Hazard Communication and General Employee Radiation Training (MSD 10A, EHS 405, and MSD 10B; or EHS 10/405/392 and MSD 10B)

You may fulfill this training requirement by viewing the on-line training module at http://www.lbl.gov/msd/Internal/Training/MSD_training.html. After you have completed these on-line courses please notify your LBNL Supervisor so that you may be properly credited with completion.

B. Depending upon your activities at LBNL, you may have to complete the following courses.

- Basic Electrical Hazard Awareness, EHS 260
- Chemical Hygiene Safety Training, EHS 348
- Hazardous Waste Generator Training, EHS 604
- Compressed Gases and Cryogen Safety, EHS 231

These courses are also available on-line at the above web address.

If you would like to have other coursework considered as equivalent to the above, please list these courses (and the institution at which they were completed) here.

C. All users are required to have On-the-Job training sufficient to allow them to work safely. Upon arrival at LBNL NCEM, please take a moment to familiarize yourself with the locations of critical safety items such as exits, eyewashes, safety showers, and others. Ask an NCEM employee to orient you to the Preparation Laboratory if necessary.

Do you plan to visit for less than one week? ____ yes ___no

3. General Safety Rules

- To use the specimen preparation facilities, you must have an approved proposal and you must have filled out the appropriate forms.
- Do not work in the chemical lab when there is nobody else around, for example on weekends or evenings. While working in the chemical lab, leave both lab doors unlocked so help can gain access immediately in case of accident.
- You must know your supervisor. Contact him/her in case of any doubts.
- *All injuries, no matter how slight, must be reported.* Notify your supervisor (if he/she is available) *and* report to Health Services, Building 26, for evaluation. If the accident occurs after hours or on a weekend, call LBNL Fire at x7911 for medical attention (if necessary), and follow up with Health Services, Building 26, the next working day.
- Study the attached safety summary, which is incorporated into these safety rules.

4. Certification

I have read and understand this Safety Training Advisory and Checklist and agree to follow all prescribed safety procedures. Additionally, I attest to the fact that I have taken the applicable safety courses listed here, which authorize me to proceed with this project at the NCEM facilities.

Name (Print) _____

Signature _____

LBNL Supervisor _____

Date _____

NCEM Chemical Lab Safety

Be careful

- Do not work in the chemical lab without others on site. While working in the chemical lab, leave both lab doors unlocked so help can gain access immediately in case of accident.
- Use protective gloves, apron, goggles & face shield.
- Work under the fume hood. Do not smell your chemical solutions.
- Acquaint yourself with the properties of all chemicals that you use, to know remedial first aid for likely accidents.

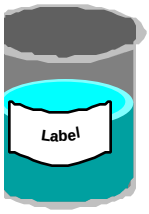
Know how to mix

- Measure your solutions using a glass or plastic graduated cylinder.
- Measure the reducing substance (e.g. methanol or water) first; pour it into a crystallizing dish. Use a cooling bath of methanol & liquid nitrogen to cool reducing substance externally.
- Measure & always pour oxidizing agent (acid) slowly into cooled reducing substance. Mixing should be slow, with effective stirring.
- Do not let your chemical solution overheat during use; an explosion could result. This is critical for all acids, but especially important with the use of sulfuric, nitric & perchloric acids.
- Never pipette acids or chemicals by mouth.

Recycle ***It's all coming back***

- *Never* pour chemicals down the drain.
- Dispose of all chemicals in the appropriate containers following proper Satellite Accumulation Area (SAA) guidelines that are displayed on top of the SAA site in room 102.
- If you have any questions about hazardous waste, contact EH&S staff member John Seabury at 486-6547.

Label and Store ***Don't make us guess***



- Label your work area with a form including your name, date, & chemicals in use.
- To store a solution, label it with name, date & chemical composition.
- Warm or newly mixed solutions should never be stored in a screw-cap bottle. Minimize the risk of explosion by covering container with a cork or parafilm secured with a rubber band.

- Cold solutions will expand as they are mixed and warm up. They can explode a tightly capped container. Therefore, keep labeled containers with freshly mixed solutions in hoods and never close them tightly.

Spills

- In case of a spill, the first priority is safety of personnel. An emergency eyewash and safety shower are available in the lab. If eyes or body are splashed, DO NOT DELAY USING THE EYEWASH AND SAFETY SHOWER. They should be used for a minimum of 15 minutes.
- In case of injury call LBNL Fire at x7911.
- In case of skin contact with HF, liberally apply calcium gluconate cream (in labeled boxes inside the lab) and go to Health Services (B26) immediately (working hours) or call LBNL Fire at x7911 (after hours or on weekends).
- Spill kits consisting of sodium bicarbonate and absorbent are available in the large containers near the safety shower. You may safely clean up a spill if:
  - You are aware of the hazards of the material and the cleanup procedures.
  - There is no potential for personnel injury or environmental contamination.
  - The cleanup material available is appropriate for the spilled chemical.
  - It is small enough that two people will expend an hour or less.
  - The eyewash and safety shower are nearby and accessible.

For all spills, follow the S.W.I.M.S. guidelines.

- **S**TOP and THINK. Stop work and stop the spill. Assess the situation. How big is it? Has there been any eye, skin or personal clothing contact?
- **W**ARN OTHERS. Call x7911 if there is a medical emergency or danger to life, health or the environment.
- **I**SOLATE THE AREA. Restrict access to the area to prevent others from becoming contaminated, and to limit the spread of contamination.
- **M**ONITOR YOURSELF carefully and completely. Look for any signs of chemical contamination or signs/symptoms of overexposure.
- **S**TAY in or near the area until help arrives. Be available to assist emergency personnel. Notify your supervisor.

NCEM Chemical Lab Safety

Commonly used acids and solutions

Nitric acid: The most common electropolishing solution is nitric acid with methyl alcohol. Do not use ethyl alcohol instead - Ethyl alcohol mixed with nitric acid creates a bomb.
Remember, cooled solutions expand as they warm up. Do not store in tightly capped bottles until they reach room temperature.

Perchloric Acid: All perchloric acid solutions must be handled under our perchloric acid/water-fan circulation fume hood, with window lowered for protection.
Perchloric acid stock solutions kept in the lab must have a density not exceeding 1.48 (60%).
To avoid the risk of overheating, perchloric acid solutions should be kept cool (<35°C) during the mixing & polishing operations of use.
Break the circuit before removing the specimen. This is to avoid sparks from igniting the polishing solution.
Organic plastic fittings or carbon electrodes must not be used with perchloric acid solutions. (e.g. PTFE holder)
Perchloric acid solutions should not be used to polish alloys containing bismuth; an explosive compound may form as a result.
If perchloric acid solution is spilled on wooden fixtures, wipe it up immediately and dispose of the wipes as hazardous waste, Perchloric acid makes wood susceptible to combustion.

Hydrogen Fluoride: HF burns are extremely dangerous. Any skin or suspected contact with HF should be treated by copious irrigation with water for at least 15 minutes. To prevent damage that results if acid penetrates to deep tissue layers, apply calcium gluconate gel. A first aid kit for HF burns is located on the shelf of a cabinet close to the entrance door.

After first aid for HF contact immediately visit Health Services, B26 during working hours, or call x7911 after hours or on weekends.

Lactic Acid: Lactic Acid may cause skin and eye burns.

Formic Acid: Formic acid may cause irreversible eye injury. Contact with the liquid is corrosive and can cause severe burns and ulceration.

Sulfuric Acid: Strong inorganic acid mists containing sulfuric acid can cause cancer. The acid may be irritating to skin, eyes.

Acetic Acid: Acetic acid can cause burns, loss of voice, difficulty breathing, and lung congestion. This weaker acid is commonly mixed with HF and nitric acid.

Please be aware that any chemical is a potential health hazard. Information about a particular material can be obtained from the Materials Safty Data Sheets at the EH&S web site:

www.lbl.gov/ehs/

If there is ANY doubt about a procedure you MUST contact your supervisor.